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AGENT FOR PREVENTING BROWNING

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AGENT FOR PREVENTING BROWNING

[Kabben boshizai]

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Claims

1. An agent for preventing browning characterized by containing ascorbic acid or its derivatives and flavonoid glucosides.

2. The agent for preventing browning described in Claim 1 in that the flavonoid glucoside is one or a mixture of two or more selected among rutin, quercitrin, isoquercetin, peltatoside and hyperoside.

3. The agent for preventing browning described in Claim 1 in that the flavonoid glucoside is a glucoside freely soluble in water which is obtained by the action of an enzyme having transglycosylating activity on one or a mixture of two or more selected among rutin, quercitrin, isoquercetin, peltatoside and hyperoside in the presence of lactose or galactooligosaccharides and/or starch.

4. The agent for preventing browning described in Claim 3 in that the enzyme having transglycosylating activity is an enzyme having transferring activity of galactose residues or an enzyme having transferring activity of glucose residues or a mixture of an enzyme having transferring activity of galactose residues and an enzyme having transferring activity of glucose residues.

Detailed explanation of the invention

Industrial application field

The present invention pertains to a method of preventing browning. Accordingly, the application fields include the food industry, cosmetic industry, pharmaceutical industry and other industries for which browning is a problem.

Prior art

Browning of food, pharmaceuticals and cosmetics during processing or storage very often reduces the quality of the products in general. Most of said phenomena are due to the browning of the natural products. There are still many unclear aspects with respect to the cause for the browning, but mainly there are two types of browning, enzymatic browning and nonenzymatic browning. Enzymatic browning includes the browning that occurs rapidly when the cut surface of fruits or vegetables are exposed to air. The browning of apples, pears and peaches can be cited as the examples of this type of browning. The browning caused by aminocarbonyl reaction of reduced sugar and amino acid (Maillard reaction) is a typical nonenzymatic browning. Examples include the browning of squid and cod. Colors are important characteristics of the quality of food, pharmaceuticals and cosmetics so that demands for the techniques of preventing the browning are very high.

The most generally utilized conventional agents for preventing browning are ascorbic acid and its derivatives in general, which are utilized widely for preventing various enzymatic and nonenzymatic browning.

However, using ascorbic acid solely could in turn cause browning or promote browning so that there is restriction to its application method. A patent application had already been issued for the applicant of the present invention and patent application for a method of preventing browning of food by enediol type oxides of ascorbic acid (Japanese Kokai Patent Application No. Hei 1[1989]-99719), but said patent applications had no bearing whatsoever in terms of suggestions or restrictions on the present invention.

Problems to be solved by the present invention

The present invention was accomplished with the objective of solving the aforementioned problems that occur when ascorbic acid is utilized as an agent for preventing browning and is pertaining to an agent for preventing browning which is effective in many fields including food.

Means to solve the problems

The present inventors conducted repeated investigations with respect to methods of preventing browning of food and others, and as a result, accomplished the present invention by developing a highly effective agent for preventing browning compared with the case where ascorbic acid is used solely. Specifically, it was discovered that an agent having higher effect could be obtained by incorporating a flavonoid glucoside in ascorbic acid or derivatives thereof.

The agent of the present invention for preventing browning can be obtained by adding a flavonoid glucoside to ascorbic acid in equal amount or less. In general the concentration of ascorbic acid is preferably in the range of 0.1-30% (wt%, same hereafter) and that of the flavonoid glucoside is preferably in the range of 0.05-30%. The ascorbic acid utilized in the present invention may be in free acid form or derivatives of ascorbic acid including salts such as sodium salt, esters with fatty acids and ethers with saccharides. The flavonoid glucosides utilized in the present invention include, in addition to rutin, quercitrin, isoquercetin, peltatoside and hyperoside, glucosides freely water-soluble that are obtained by the action of an enzyme having transferring activity of galactose residues or an enzyme having transferring activity of glucose residues or a mixture of an enzyme having transferring activity of galactose residues and an enzyme having transferring activity of glucose residues on one or a mixture of two or more selected from these glucosides. These flavonoid glucosides can be utilized singly or as a mixture of 2 or more. It is more advantageous if the freely-soluble flavonoid glucosides are obtained according to the method of preparation of flavonoid glucosides freely soluble in water disclosed in Japanese Kokai Patent Application No. Hei 1[1989]-213293 by the applicant of the present patent application, the method of preparation of flavonoid glucosides freely soluble in water disclosed in the patent application of the present applicant filed on July 6, 1990, the method for water-soluble flavonoid glucosides disclosed in the patent application of the present applicant

filed on July 6, 1990, the method for preparing flavonoid glucosides freely soluble in water disclosed in the patent application of the present applicant filed on July 6, 1990 and the method of modifying flavonoid glucosides disclosed in the patent application of the present applicant filed on July 6, 1990. The reference examples of the flavonoid glucosides freely soluble in water are shown in the following.

Reference Example 1

10 g of rutin was dispersed in 2 L of water, to which 1 g of naringinase was added and the mixture was held for 24 h at 60°C. The pH of the system was 6. The mixture was chilled to below 10°C and 6 g of product separated from isoquercetin was obtained. 5 g of the separated product and 30 g of corn starch were added to 5 L of 0.01M disodium hydrogen phosphate-sodium dihydrogen phosphate buffer solution of pH 6.7 and mixed until homogeneous, to which 2 mL of cyclodextrin glucanotransferase (product of Amano Pharmaceutical K.K., trade name Contizyme) was added and the mixture was held for 2 h at 55°C. This was concentrated and dried to give 36 g of yellow solid (the flavonoid glucoside obtained in Reference Example 1 is called glucoside A hereafter).

Reference Example 2

20 g of glucoside A prepared by the method in Reference Example 1 and 200 g of lactose were dissolved in 100 mL of 0.1M phosphate buffer (pH 7.0), to which 1 g of β-galactosidase (enzyme titer 20,000 units) produced by Yamato Kasei K.K from *Bacillus circulans* was added and stirred for 4 h at 60°C. After the reaction, the mixture was diluted with 1 L of water, which was passed through a column packed with 1000 mL of porous polymer formed with styrene-divinylbenzene for 1 h, followed by eluting with 5 L of deionized water for 1.5 h. Afterward, 2 L of 40 V/V% methanol was passed for 1 h to elute the adsorbed product. The methanol solution was concentrated and dried to give 25 g of product as yellow solid (the flavonoid glucoside obtained in Reference Example 2 is called glucoside B hereafter).

The agent of the present invention for preventing browning may be utilized in any product form, for example, in powder form, granular form, liquid form, paste form and other suitable forms. For example, it can be utilized in powder form by adding gum arabic or dextrin, and for example it can also be utilized in liquid form by using ethanol, propylene glycol, glycerin or a mixture thereof for dissolution. Also, compounds such as metaphosphoric acid, dicarboxylic acids, tricarboxylic acids, EDTA and phytic acid generally employed for stabilizing ascorbic acid may be utilized without any problem.

Detailed explanation is given in the following using application examples.

Application Example 1

1.5 parts (parts by weight, same hereafter) of rutin was dissolved in 225 parts of hot ethanol and 75 parts of glycerin, followed by adding 2.25 parts of ascorbic acid and 75 parts of deionized water, which was mixed thoroughly to give liquid agent A for preventing browning.

Application Example 2

15 parts of glucoside A prepared in Reference Example 1 was added to 20 parts of ascorbic acid and 35 parts of deionized water, which was mixed thoroughly to give liquid agent B for preventing browning.

Application Example 3

15 parts of glucoside B prepared in Reference Example 2, 20 parts of ascorbic acid and 65 parts of dextrin were added to 120 parts of deionized water, which was spray-dried to give powder agent C for preventing browning.

Next, the effect of the agent of the present invention for preventing browning is validated in the following experiment examples.

Experimental Example 1

Na ascorbate or the agent for preventing browning obtained in Application Example 1 or Application Example 2 was added to 35 parts of apple, 40 parts of granular sugar, 0.6 part of pectin, 0.4 part of citric acid and 24 parts of deionized water to prepare jams by conventional methods. Sterilization was conducted at 90°C for 20 min after the products were filled in containers. Afterward, the products were stored at 25°C and 35°C for testing. The degrees of browning of the jams were compared with that of the sample having no addition of the agent for preventing browning 2 weeks and 4 weeks after the start of the experiment by sensory evaluation at 4 stages shown below,. The result is shown in Table 1.

Table 1

① サンプル	② アスコルビン酸最終濃度	③ 2週間後		④ 4週間後	
		25℃	35℃	25℃	35℃
⑤ アスコルビン酸Na 0.020%	0.02%	++	+	++	−
⑥ 褐変防止剤A 3.33%	0.02%	+++	++	+++	+
⑦ 褐変防止剤B 0.1%	0.02%	+++	++	+++	++

Key: 1 Sample
2 Final concentration of ascorbic acid
3 After 2 weeks
4 After 4 weeks
5 Na ascorbate
6 Agent A for preventing browning
7 Agent B for preventing browning

Criteria of evaluation of the effect of preventing browning

−: No effect
+: Somewhat effective
++: Effective
+++: highly effective

Experimental Example 2

Na ascorbate or the agent for preventing browning obtained in Application Example 3 was added to 20 parts of liquid sugar of fructose and glucose, 5 parts of granular sugar, 1 part of gelling agent, 18 parts of peach butter and 56 parts of deionized water to prepare jellies by conventional methods. The pH was adjusted to 3.6 with citric acid. Sterilization was conducted at 80°C for 30 min after the products were filled in containers. Afterward, the products were chilled with water and stored at 25°C and 35°C for testing. The degrees of browning of the jellies were compared with that of the samples having no addition of the agent for preventing browning 2 weeks and 4 weeks after the start of the experiment by sensory evaluation at the same 4 stages as in Experimental Example 1. The result is shown in Table 2.

Table 2

① サンプル	② アスコルビン酸最終濃度	③ 2週間後		④ 4週間後	
		25℃	35℃	25℃	35℃
⑤ アスコルビン酸Na 0.02%	0.02%	+++	−	++	−
⑥ 褐変防止剤C 0.1%	0.02%	+++	++	+++	+

Key: 1 Sample
2 Final concentration of ascorbic acid
3 After 2 weeks
4 After 4 weeks
5 Na ascorbate
6 Agent C for preventing browning

Effect of the invention

As is clearly shown by the aforementioned application examples and experimental examples, the present invention pertains to an agent having high effectiveness in preventing browning characterized by being formulated with ascorbic acid and flavonoid glucosides.